

# **SmartPak Welding Controller**

## **WK-MPS-16 Constant Current**

### **WESTKEN Electronics Division**

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### **Features**

- Latest state of the art ATMEL 8 bit microprocessor technology
- Synchronous digital welding control allows absolute precision
- Up to 16 programmers available
- Simple to use pushbutton keys
- All inputs optically isolated using +24V DC activation
- All outputs optically isolated
- Memory retention after power-down or mains failure
- Constant Current
- 4 lines x 20 characters alpha-numeric LCD display
- Front panel LED's for all inputs, outputs & control operations
- Relay contacts for air valve switching – AC or DC.
- End of Sequence pulse (EOS) Relay Contacts – N/O or N/C
- Hi Lift Relay Contacts – AC or DC switching.
- 1<sup>st</sup> & 2<sup>nd</sup> Stage Initiation
- 1/2 Cycle Option Selectable
- Pulsation Option Selectable
- Meets European CE standard
- Seam Welding
- Alarm outputs
- Programmable Heat adjustment for tip wear

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- Data output - RS232 /RS485/ Ethernet
- Variable air pressure valve control with 5 recipes
- Dipswitch selectable menus
- Dual Gun (special output board)
- Current readout in Standard Mode & Constant Current  
(feedback coil required)
- Pgm sel – External selector or using the keypad



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# SMARTPAK USER MANUAL

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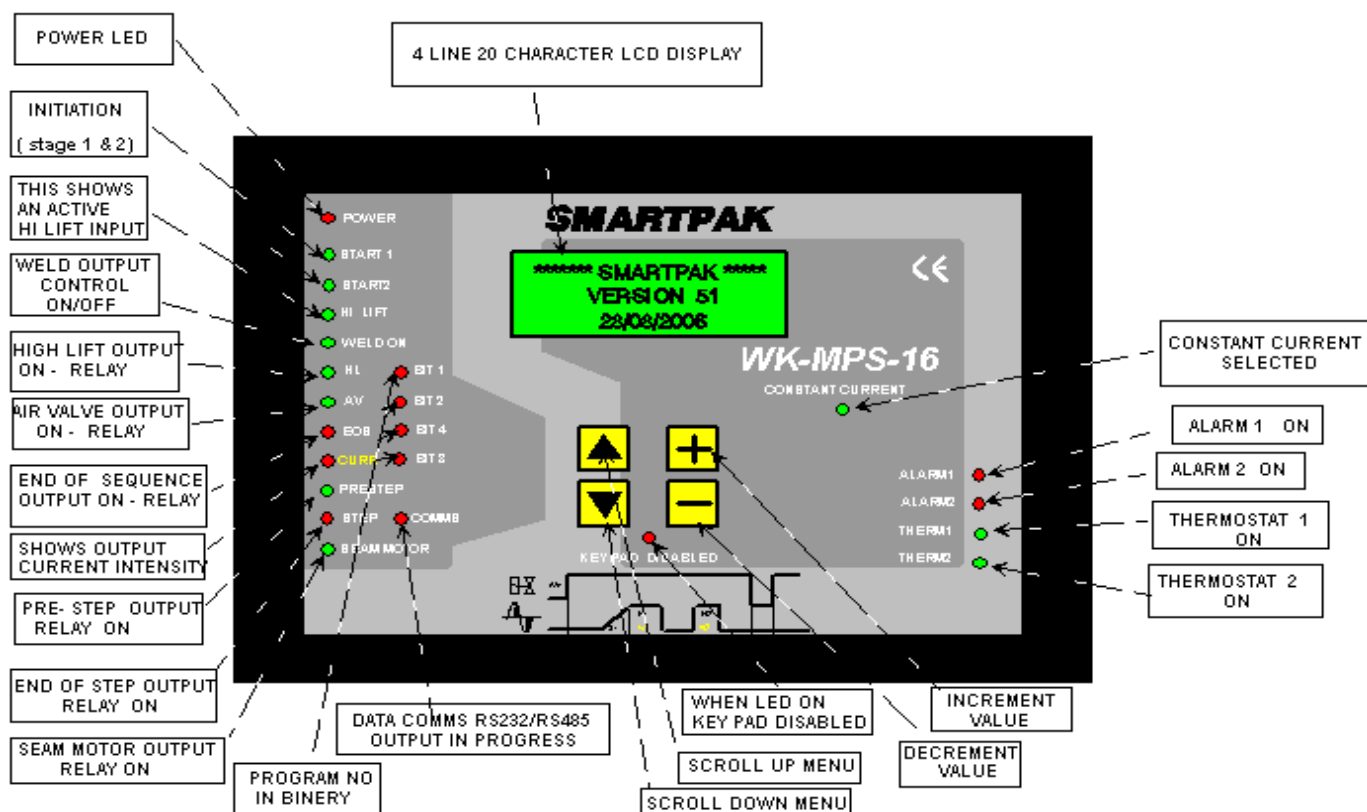
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# FRONT PANEL DISPLAY



1. **Power Led (red) :-** This shows when there is power +12v coming to the Display board.
2. **Initiation(green) :- Start1 & Start2 .** This is used to initiate welding . **Start1** will enable the airvalve while **Start2** will complete the initiation process and allow the welding to start.  
Often both start1 & start2 and joined together (they are not used separately).
3. **High Lift Input(green) :-** This led will come on when the there is a +24v signal on the high lift input.
4. **Weld Output On/Off Control(green):-** This is enabled/disabled by a+24v signal on the weld on/off input. This will enable or disable the welding output to Scr's of the stack. Therefore one can go through the welding sequence without any welding taking place by disabling the Weld on/off output. This output can also be controlled by using lcd display /keypad. This control is in the weld menu.
5. **High Lift Relay (green):-** This led will go on when the High Lift relay is turned on.
6. **Air Valve Relay (red):-** This led is turned on when the Air valve relay is turned on.

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- 7. End Of Sequence (Red):-** This led comes on when the Eos relay is enabled. This signifies the weld cycle is complete and that it is now ready for another initiation.
- 8. Weld Current (red):-** This led shows the weld current intensity. The brighter led is the greater the weld current.
- 9. Pre-Step (green):-** This led comes on when the pre-step relay is turned on. This will happen when stepping is enabled in the step menu. Stepping is used to counteract tip wear which results in welding current reduction. On each step the current is increased by the predetermined amount selected in the menu by change. Pre step comes on one weld cycle before the End of Step output.
- 10. Step (End of Step)(red):-** This led comes on when the end of Step relay is turned on. This means that the tip needs replacing . Welding can continue however the end of step relay can be used to stop welding.
- 11. Seam Motor Relay (red):-** This comes on when seam welding is selected in the menu and welding has been initiated at the same time as the air valve. It is used to turn on the seam motor which is used to advance the material being welded.
- 12. Program Number (in binary – red):-** This is the program number which has been selected via a thumbwheel switch or the PLC . The red leds show the number in binary notation.
- 13. Data Comms Led (red):-** This led comes on to data comms output in progress. This is the data output which can be selected in RS232 ,RS485 or Ether net mode. The data gives a record of the welding operation and can be used as a record of the welds .
- 14. Scroll Up Key :-** This key is used to scroll up through the menu's on the Lcd screen.
- 15. Scroll Down Key :-** This key is used to scroll down through the menu's on the Lcd screen.
- 16. Keypad Disable Led (red):-** This led comes on when the keypad has been disabled.
- 17. Plus Key (+):-** This key is used to increment values selected on the Lcd screen.
- 18. Minus Key (-):-** This key is used to decrement value selected on the Lcd screen.
- 19. Thermostat 2 (green):-** This led comes on when the thermostat 2 input has been enabled ie 0V is present at thermostat 2 input of the output board.
- 20. Thermostat 1 (green):-** This led comes on when the thermostat 1 input has been

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enabled ie 0V is present at thermostat 1 input of the output board.

**21. Alarm 2 (red) :-**

The alarm 2 led comes on when the alarm 2 relay has been turned on. Alarm conditions that would cause it to come on are End of Step and Current out of limits (only constant current.)

**22. Alarm 1 (red) :-**

The alarm 1 led comes on when the alarm 1 relay has been turned on. Alarm conditions that would cause it to come on are High Lift not enabled , thermostat alarm and current too low (only constant current).

**23. Constant Current Led (green):-**

This led is turned if constant current has been selected for welding.

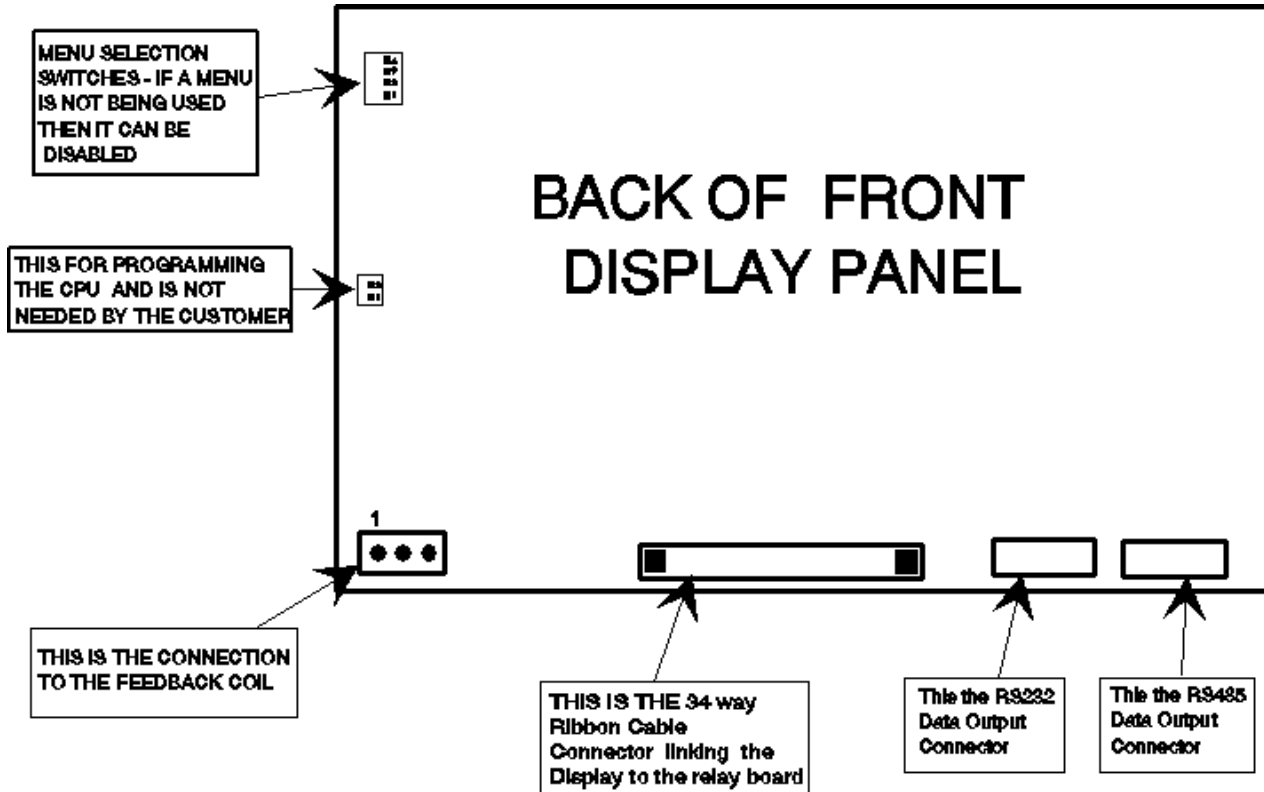
**24. LCD DISPLAY :-**

This is a four by 20 alpha numeric Lcd display which also has backlighting.

## **BACK OF FRONT PANEL DISPLAY**

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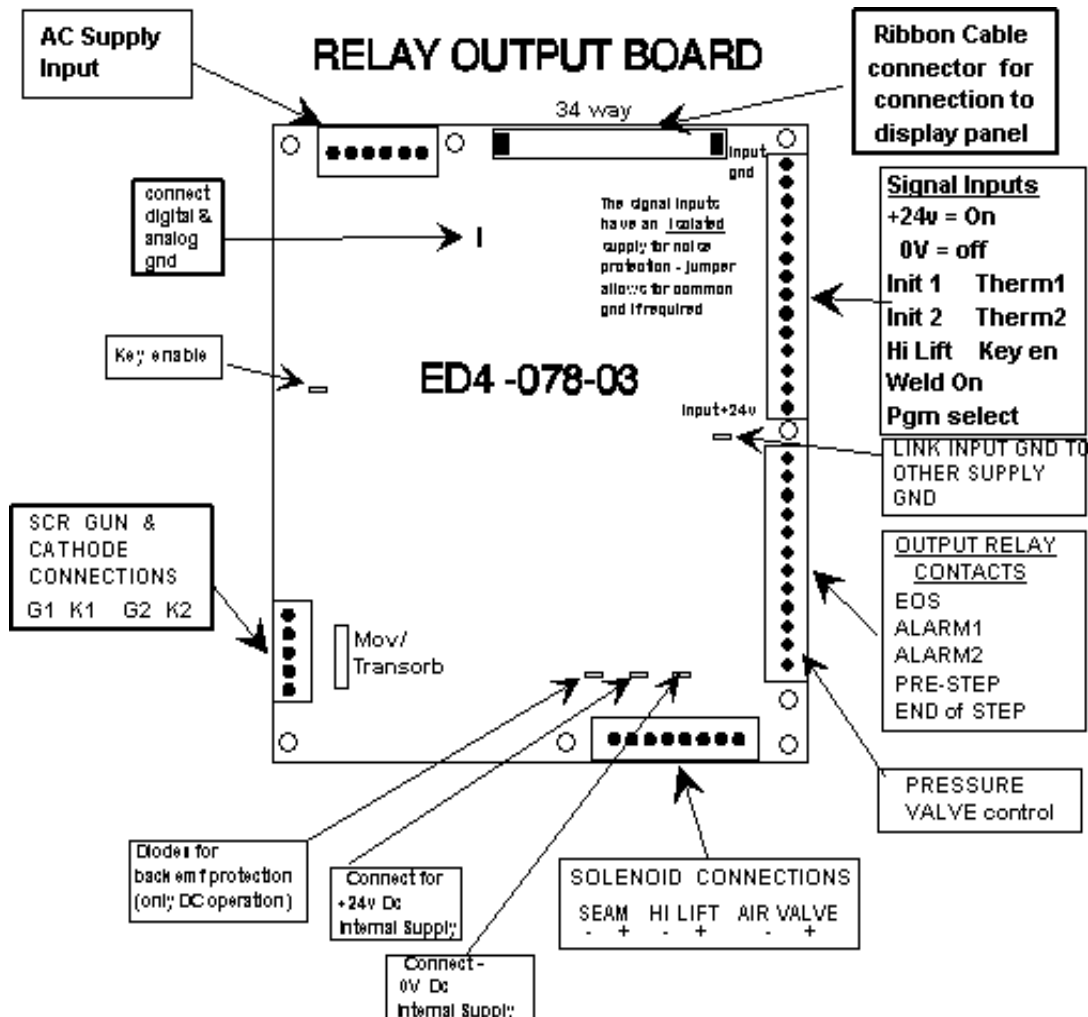
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1. **Menu Selection Dip switch :-** This is allows menus which are not being used **Step, Data comms , constant current & Air pressure** to be deselected. By switching the dip switches to the on position.  
**Switch 1 :-** Current menu & Restricted Machine Calibrate  
**Switch 2 :-** Air Pressure Menu  
**Switch 3 :-** Data Comms Menu  
**Switch 4 :-** Step Menu Restricted
2. **Programming Dip Switch :-** This is used to programme the cpu and is not needed by the customer. Should be in the On position.
3. **Feedback Connector:-** This connector is for the Rogowski feedback coil . Pin 1 is the hot wire Pin 2 must be connected to gnd and Pin3 is gnd .
4. **Ribbon Cable Connector:-** This a 34 way ribbon cable connector to connect the Front Panel Display to the relay board.
5. **RS232 Connector:-** This is the RS232 data output connector . Pin 2 is Tx , Pin 3 Rx and Pin 8 is gnd.
6. **RS485 Connector:-** This is the RS485 data output connector. Pin 2 is Txa , Pin 2 is TXb. Pin 5 is RXa and Pin 6 is RXb. Pin 7 is Gnd.



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**RELAY OUTPUT BOARD**



- 1. Ac supply input :-** This is a 19v @10VA ,14v@8VA & 19v@30VA ac supply can from 220 or 380v AC.
- 2. Jumper JP1 :-** This is to connect analog and digital gnd. It should linked for most operating conditions.
- 3. Jumper JP2:-** Key enable . This is to enable the keypad and can be used to override the key enable/disable input.
- 4. Scr firing connections :-** This is the SCR firing pulses that control the current . These

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pins are for the gate and cathode of scr1 & scr2. A mov or transorb can be fitted to provide extra protection for the SCR's .

**5. Jumper JP6 :-** This is used to connect the 3 diodes on the Hi Lift , Seam & Air valve. For back emf protection generated by the solenoids. (*Not connected for AC solenoids*)

Connected when using DC solenoids.

**6. Jumper JP4 :-** This the +24v for DC solenoids which are using the relay board's internal supply. (*this jumper is not connected when using ac solenoids or an external dc supply*)

**7. Jumper JP5 :-** This the internal 0V for DC solenoids which are using the relay board's internal supply. (*this jumper is not connected when using ac solenoids or an external dc supply*)

**8. Solenoids**

**Connection:-** These are the connections for the Seam,Hi Lift & Air valve solenoids

**9. Air Pressure**

**valve control :-** This is the variable air pressure control voltage ouput.

1. This is connected the valve control circuit as well as gnd

**10. Output Relay**

**Contacts :-**

These contacts are for EOS,ALARM1,ALARM2,PRE\_STEP

1. & End of Step. The N/O contact and the Com are available.

**11.Signal Inputs :-** These are signal inputs +24v is on and 0v is off. (except for

1. thermostats which reversed). The signal +24v is available on the connector as well as the Input gnd. These

are isolated from the

2. solenoid 24v supply for noise protection.

**12. Ribbon Cable**

**Connector :-**

This is a 34 way ribbon cable connector used to connect the display panel to the relay board.

## SmartPak Menus

The WK-MPS-16 welding controller offers up to 16 different programs and is designed for use with single-stage or dual-stage initiated projection & spot welding stations.

### Function: MWK-MPS-16 (Projection/Spot)

#### Weld Menu

Parameter	Minimum	Maximum	Resolution	Global
Weld 1	0	99	1 Cycle	No
Weld 2	0	99	1 Cycle	No
Weld 3	0	99	1 Cycle	No
% Heat 1	10%	99%	1%	No
% Heat 2	10%	99%	1%	No
% Heat 3	10%	99%	1%	No
Weld On/Off	-	-	On/Off	Yes

**Default setting for Weld On/Off is on**

Three weld procedures are possible at the %heat can be set from 10% to 99% When the number of weld cycles is 0 they will not be used. Ie for Weld2 & Weld3.

**Weld On/Off:** This a control available as an external control or internal(keypad) to turn the welding on or off. This will not stop the timer going through the complete cycle the only difference being that there will be no welding current.

#### Constant Current

Parameter	Minimum	Maximum	Resolution	Global
Constant Current	-	-	On/Off	No
Target Current 1	1 KVA	60 KVA	100 VA	No
Target Current 2	1 KVA	60 KVA	100 VA	No
Target Current 3	1 KVA	60 KVA	100 VA	No

**DIP SWITCH 1(enable menu)**

**Constant Current :-** This is a prime feature of the timer and will using a feedback coil to measure the current will keep the current constant to a pre-selected target . Each welding procedure has a separate target setting. Constant current needs to be selected for a particular program

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and will show it has been selected by a green led on the faceplate of the Smartpak.

#### Restricted Machine Calibration

Parameter	Minimum	Maximum	Resolution	Global
Coil Output	80mV	220mV	1mV	Yes
Transformer Type	50KVA	400KVA	-	Yes
Cal Machine	1 - Yes/No	2 - Yes/No	-	Yes
C Limits enable			Yes/No	Yes
U%	4%	25%	1%	Yes
L%	4%	25%	1%	Yes

#### DIP SWITCH 1 (enable menu)

**Coil Output :** This allows the user to adjust the Smartpak to cater for a feedback coil which does not have 150mV /1000 amps output and it more or less as required.

**Transformer Type:** This the transformer of the welding machine. It needs to correctly selected and this will occur when the calibration is done. This can still be altered if required. This affects the constant current characteristics of the Smartpak..

**Cal Machine :** or calibrate machine. This needs to be done when the machine is being installed and should not need be done unless the timer is changed or the welding machine is modified.

When the calibration is done the “N” will change to a “Y” showing that the calibration has been done. In **Dual mode** a 1 & 2 will show as there are now two transformers. The calibration must be done separately for both transformers .

**C Limits Enable :** (Current Limits enable) Current limits can be set which - when welding in constant current are exceeded will bring up an Alarm (alarm2). The limits are a percentage of the welding current target eg 5% (upper limit ) 7% (lower limit). So when the actual current exceeds the limits set the alarm will come on. This will not stop welding how ever the alarm2 output can be used disable welding.

**U% :** This refers to the **Upper Limit** and is set between a minimum of 4% up till 25% maximum.

**L% :** This refers to the **Lower Limit** and is set between a minimum of 4% up till 25% maximum.

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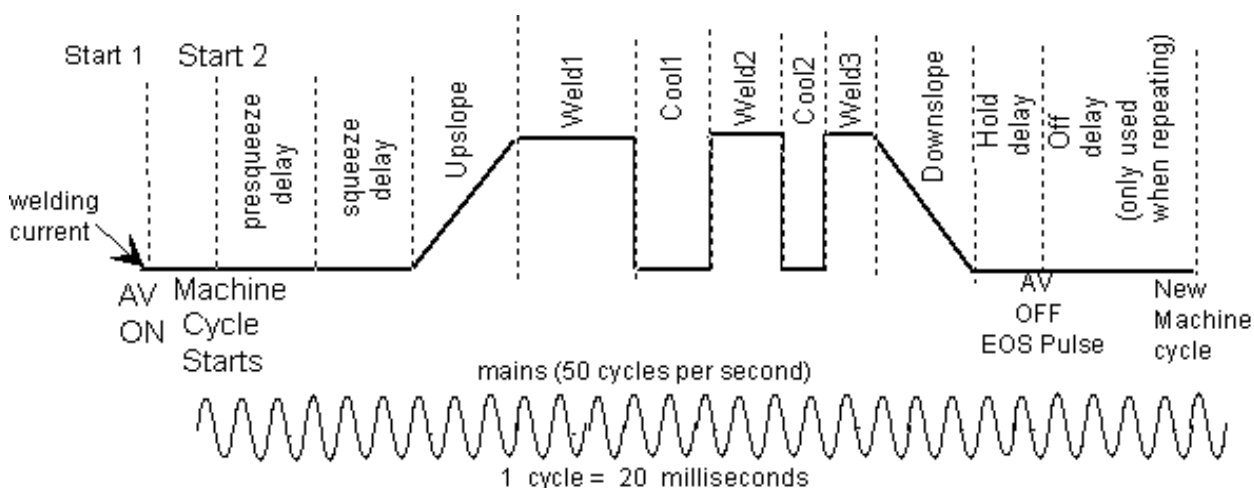
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**Delay Menu**

Parameter	Minimum	Maximum	Resolution	Global
Pre-squeeze	0	99	1 Cycle	No
Squeeze	0	99	1 Cycle	No
Cool	0	99	1 Cycle	No
Cool2	0	99	1 Cycle	No
Hold	0	99	1 Cycle	No
Off	0	99	1 Cycle	No

**NB** Repeat is enabled when Off is set too greater than 0

**Delays :-** These are delays used to space the welding and to allow time for the welding head to come down and clamp the metals together that are to be welded. Spot welding uses resistance welding so the metals need to be clamped together to reduce the resistance and to make sure the material is welded properly.

**Miscellaneous Menu**

Parameter	Minimum	Maximum	Resolution	Global
Pgm Select	0	16	1 pgm	Yes
Upslope	1	10	1	No
Pulsations	1	99	1 pulse	No
W	1	2	1	No

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seam			On/Off	Yes
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**Pgm select:** This is used to select the **external pgm select** - which normally a thumbwheel selector or can be controlled by the PLC. – or **internal pgm select** this is the done via the keypad .

**Upslope :** This slopes the current from 0 amps up to the welding current selected. This is will be a longer or shorter slope depending on how many upslope cycles are selected.

**Pulsations: -**

Is only for **Weld 2 or Weld1** depending on what has been selected in the misc menu. The number of pulsations is selectable between 1 and 99. The pulsation Cycle consists of Weld1/2 & Cool1/2 and will loop around these two until the pulsations are complete. It will then proceed with the rest of the selected cycle.

**Weld procedure Select**

This is to select whether the pulsations will be on weld procedure 1 or weld procedure 2 . Weld procedure 3 is not used.

**Seam:** This is for seam welding and will weld on the first weld procedure only. It is activated when start1 and start2 are enabled and will continue welding until start1 or start2 are turned off. The seam motor output will come on at the same time as the air valve. When start1 or start2 are turned off the smartpak turns off the seam motor and air valve and exits the weld routine . It does an EOS and is then ready to start welding again.

**Comms Selection Menu**

Parameter	Minimum	Maximum	Resolution	Global
Data Output	-	-	On/Off	Yes
RS232/RS485	-	-	select	Yes

**DIPSWITCH 3 (enable menu)**

**Data Output :** The data output provides real time information about the weld and can viewed via RS232 or RS485 or Ethernet.

**RS232/RS485 :** This is select either RS232 or RS485 comms

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**Air Pressure Menu**

Parameter	Minimum	Maximum	Resolution	Global
REF PRESS	0 bar	10 bar	0.1 bar	Yes
RECIPES	0	5	1	No
Air Press P1	0 bar	10 bar	0.1 bar	No
Air Press P2	0 bar	10 bar	0.1 bar	No
Air Press P3	0 bar	10 bar	0.1 bar	No
Air Press P4	0 bar	10 bar	0.1 bar	No
Air Press P5	0 bar	10 bar	0.1 bar	No

DIPSWITCH 2 (enable menu)

See Proportional Air Valve control Pg 19

**Reset Counters**

Parameter	Minimum	Maximum	Resolution	Global
Machine Count	0	999	Reset	Yes
Step Count	0	20	Reset	Yes

This is for resetting the counters to zero.

**Restricted Access – Global Settings**

Parameter	Minimum	Maximum	Resolution	Global
Power Factor	0	0.99	0.01	Yes
Ext Pgm Select	-	-	On/Off	Yes
Hi Latch	-	-	On/Off	Yes
Default Settings	-	-	On/Off	Yes
Dual Mode	-	-	On/Off	Yes
½ Cycles	-	-	On/Off	No

**This is intended for the technician or engineer only**

**Power Factor or PF :-** This is a global setting which in reality advances or retards the firing angle of the SCR firing pulses. It increases or reduces the heat. This global setting allows

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correction needed because of the transformer (each machine needs a slightly different adjustment.

**Ext Pgm Select :-** This allows program selection either via the external program switch or by the internal keypad.

**Hi Latch :-** This to enable Hi Lift Latch mode. This enable the hi lift to latched on with a hi lift input pulse . The next pulse will unlatch it.

**Default Settings :-** When the plus key is pressed the default settings is enabled and when The plus key is pressed again the default nsettings will be loaded into all the values.

**Dual Mode :-** Dual Mode allows the timer

#### Step Menu Restricted Global Settings

Parameter	Minimum	Maximum	Resolution	Global
No of Steps	0	20	1	Yes
Counts /Step	0	999	1	Yes
% Heat Change	0	10	1	Yes

DIPSWITCH 4(enable menu)

**This is intended for the technician or engineer only**

The above parameters are all fully programmable via the push button front panel keys and displayed in English on the 20 characters x 4-line LCD display.

Other languages can be accommodated.

**NOTE : 4 dip switches are available on the control pcb which can disable menus not being used.**

#### Push Button Keys Functions

Key	Function
FORWARD ^	Scrolls forward through the Menus & Parameter Settings
BACKWARD v	Scrolls backward through the Menus & Parameter Settings
INCR +	Increments the selected parameter setting
DECR -	Decrements the selected parameter setting

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INCR +	Used to select the Adjustment menu to change parameters
FORWARD ^ & BACKWARD v	Both Buttons pressed together - to Access The Restricted Global parameters

## Changing SmartPak Welding Controllers Settings On Each Program

### On Power Up

The message SMARTPAK will be displayed. Provided the KEY ENABLE is enabled and the controller is not welding the Backward and Forward keys will allow scrolling through the Menus. When the required Menu is reached use the **Incr +** to select the menu for adjustment. The **Forward** and **Backward** keys are then used to scroll through the parameters. The screen cursor will indicate the parameter selected and the **Incr +** and **Decr -** keys can then be used to increment or decrement the parameter setting. . Once the new value is seen on LCD screen the value is updated and will be remembered. Use the **Forward** or **Backward** keys to scroll out of the adjustment menu and return to the previous menu.

The following is an example of a typical welding controller program and what could be expected to be seen on the Liquid Crystal Display: -

```
PGM   [02] WELD MENU On
WELD1  10  HEAT1  29%
WELD2   0  HEAT2  18%
WELD3   0  HEAT3  12%
```

Press the **Incr +** key to enter the **Adjustment Menu**. You have about four seconds once the Menu is selected to proceed to the adjustment menu. The adjustment menu will look similar to This: -

```
ADJUST : Weld/ON = on
WELD1  10  HEAT1  29%
WELD2   0  HEAT2  18%
WELD3   0  HEAT3  12%
```

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You can by using the backward and forward keys scroll through the parameters. The flashing cursor will indicate the parameter selected. The incr or decr keys can be used to increment or decrement the parameter.

To **exit** the adjustment menu use the backward or forward keys until you return to previous menu.

The Pgm No is selected by the external thumbwheel. The current program number is displayed on the LCD screen.

The Hi-Lift input will disable the welding output if it is not enabled - (Both Key Enable and Hi Lift need to be connected to +24V REG if the features are not used. A jumper on the Relay board is also available to jumper the key enable.)

## CALIBRATION

For **Constant Current Operation** the weld unit must be calibrated before it is used for the first time. The Weld Unit should be set up for normal welding operation with no welding material between the bits. ***However where a larger machine( above 15KVA is being used it is better to calibrate it with the welding material that is to be used.*** When constant current is selected on the controller the Smartpak controller will ask to do a calibration . Please follow the instructions given. Once the unit has been calibrated there is no need to do it again except in a very large machine where is a big difference between welding materials.

## ALARM CONDITIONS

**TSTAT1: - IF** Thermostat (Stack) is over temperature THERMOSTAT ERROR will be seen on The display and the thermostat led and the Alarm1 led will come on. The Alarm1 has a relay output ..... :- **ALARM1**

**TSTAT2: - IF** Thermostat (Transformer) is over temperature THERMOSTAT ERROR will be Seen on the display and the thermostat led and the Alarm1 led will come on. The Alarm1 has a relay output ..... :- **ALARM1**

**HI LIFT: - If** High Lift is off HIGH LIFT OFF will be seen on the display and Alarm1 led will come on. The Alarm1 relay will also come on. :- **ALARM1**

**NO COIL: - If** no Rogowski coil (current feedback) is connected and if **Constant current** has been selected Alarm1 led will be activated – Alarm1 relay will come on and a message of **NO COIL will** be displayed – if it detects less than 400Amps input after 3 weld cycles it will give a **NO CURRENT ALARM Error**. ..... :- **ALARM1**

***This would also apply if there was no current going through the welding tips.***

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**LIMITS EXCEEDED :-** If during welding in **Constant Current** mode and the **limits** options has been selected an Upper Limit and Lower Limit for each weld will be tested . If any of the limits are exceeded for any of the welds an **ALARM2** led will come on and at the same time the **Alarm2 relay** will come on. This will not stop the unit welding and will go off once there are no limits exceeded.

**PRESTEP: - This** does not bring up an alarm however it is a warning and the Prestep led and **prestep relay** will come on 1 step before the end step.

**STEP: -** This step led will come on when the last step is reached. It will bring on **alarm 2** And it will also print the message "END OF STEPS REPLACE TIP" on the LCD screen. The counters will need to be reset before the Machine can continue. However welding can continue with these alarm conditions.

ALL ALARM CONDITIONS CAN ALSO BE SEEN IN THE DATA OUTPUT IF USED. THIS WILL GIVE A RECORD OF WHAT HAS HAPPENED SHOWING THE EXACT AMOUNT THAT THE LIMITS WERE EXCEEDED .

### **PROPORTIONAL AIR VALVE CONTROL**

5 recipes are selectable with 5 different air pressures .  
A control voltage of 0 to 10V is outputted to control the air pressure valve.

Each recipe allows a set program of different air pressures for the weld cycle so that during the weld cycle the correct air pressure is used for specific task.

# SMARTPAK AIR PRESSURE PROGRAMS

PRESS PGM 0

NO VARIABLE AIR PRESSURE

PRESS PGM 1	<b>P1</b>	SQ	<b>P2</b>			<b>P3</b>
	PSQ		Weld	Hold	Off	
PRESS PGM 2	<b>P1</b>	SQ	Weld	<b>P3</b>		Off
	PSQ			Hold		
PRESS PGM 3	<b>P1</b>	SQ	<b>P3</b>		<b>P4</b>	Off
	PSQ		Weld	Hold		
PRESS PGM 4	<b>P1</b>	SQ	Weld	<b>P3</b>		<b>P4</b>
	PSQ			Hold	Off	
PRESS PGM 5	<b>P1</b>	SQ	Weld	<b>P3</b>		<b>P4</b>
	PSQ			Hold	Off	

eg

## PGM(0) AIR PRESSURE

Press Pgm 1 REF 10v

AIR PR: P1 2.2 P2 2.7

P3 3.5 P4 5.5 P5 6.8

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### **Default Values**

The default values are loaded in all the 16 programs and will stay at these value until they have been changed. Once they have been altered they will have the new value.

#### **Default SmartPak Parameters**

<b>Function</b>	<b>Prom/Spot</b>
Pre-Squeeze	25 Cycles
Squeeze	25 Cycles
Weld 1	15 Cycles
% Heat 1	20%
Cool	0 Cycles
Weld 2	0 Cycles
% Heat 2	10%
Cool2	0 Cycles
Weld 3	0 Cycles
Hold	10 Cycles
% Heat 3	10%
Off	00 Cycles
WELD/ON	ON

**Default SmartPak Parameters**

Dual Mode	Off
Seam	Off
Coil Output	150mV
Machine Calibration	No
Upslope	0 Cycles
Current Limit	5%
½ Cycles	OFF
Power Factor	68%
Pulsations	01
High Lift Latch	OFF
Current1	3.0 KVA
Current2	2.0 KVA
Current3	2.0 KVA
Steps	0
Counts per Step	0
% Heat Change Correction	0
Machine Cycle count	0
Step Count	0
Data Output	OFF
RS232	Selected

## SMARTPAK DATA OUTPUT

This available in **RS232 ,RS485 & Ethernet.**

**RS232 :-** This is a serial data stream and can work up to a distance 15meters

**RS485 :-** This a balanced serial data stream and can work up to 2 km.

**Ethernet :-** This a **Local Area Network (LAN)** and will connect to a standard industrial Network. The data output from the Smartpak is then sent via this network

The purpose of the data output is to give a real time record of the welding process which can be used for monitoring , quality control , tip & tool wear and fault analysis by engineer in charge.

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**This is an example of the Data output feature of the Smartpak :-**

\*\*\*\*\*STANDARD MODE\*\*\*\*\*

Programme No 00 P.F. 0.82

Weld ON/OFF : ON  
Pre-sq 25 squeeze 25  
Cool 00 Cool2 00  
Hold 10 Off 00

Weld 1 Cycles 16 Heat 53% CURRENT W1: 04.6 KA

Weld 2 Cycles 00 Heat 10%

Weld 3 Cycles 00 Heat 10%

\*\*\*\* ALARMS STATUS \*\*\*\*

NO ALARMS

MACHINE CYCLE 01384

CURRENT W2: N0.3 KA

Weld 3 Cycles 16 Heat 24%

CURRENT W3: W4.0 KA

MACHINE CYCLE 132

\*\*\*CONSTANT CURRENT MODE\*\*

Programme No 00 P.F. 0.82

Weld ON/OFF : ON

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*WK-MPS-16 SmartPak version 52*

Pre-sq 25 squeeze 25  
Cool 00 Cool2 00  
Hold 10 Off 00

CURRENT TARGET

Weld 1: 16 cycles 04.0 KA 04.0 KA

\*\*\*\* ALARMS STATUS \*\*\*\*

NO ALARMS

MACHINE CYCLE 01401

The rated voltages for the air valve solenoids are 24V dc - 1 amp or 110 V ac - 1 amp.

All other connections are provided on the Relay output board.

**See customer connections.**

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**5685**